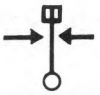

PNP TRANSISTOR


QUARTZ CRYSTAL


HEADSET


CROSSING CONDUCTORS (not jointed)


VIBRATOR


FIXED RESISTOR


VARIABLE CAPACITOR


NPN TRANSISTOR

Science Fair™

ELECTRONIC PROJECT KIT #28-109

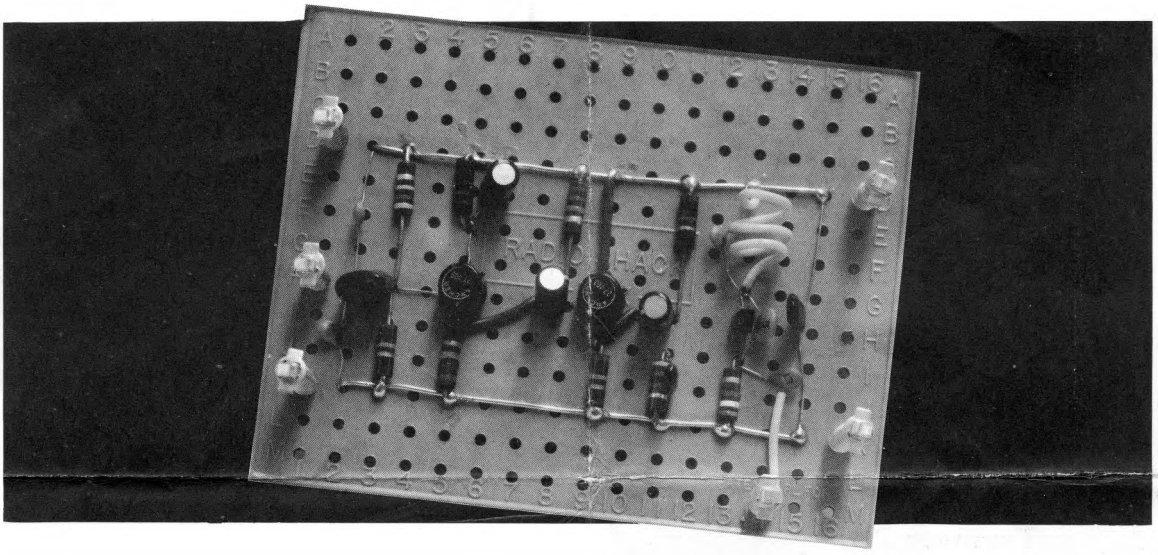
FM WIRELESS MICROPHONE


PENTODE TUBE

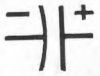

SPEAKER


IRON CORE TRANSFORMER


ADJUSTABLE RESISTOR




GROUND


ELECTROLYTIC CAPACITOR

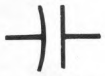

VARIABLE CAPACITOR


AIR CORE TRANSFORMER


CHASSIS CONNECTION (GND.)


S.P.S.T. SWITCH


RECTIFIER


FIXED CAPACITOR


ANTENNA


MULTICELL BATTERY


JOINED CONDUCTORS


TRIODE TUBE


SINGLE CELL BATTERY

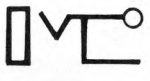

ZENER DIODE


HAND KEY


NEON (A.C.)


VOLTAGE DEPENDENT CAPACITOR


MICROPHONE


PHONE JACK


TUNNEL DIODE

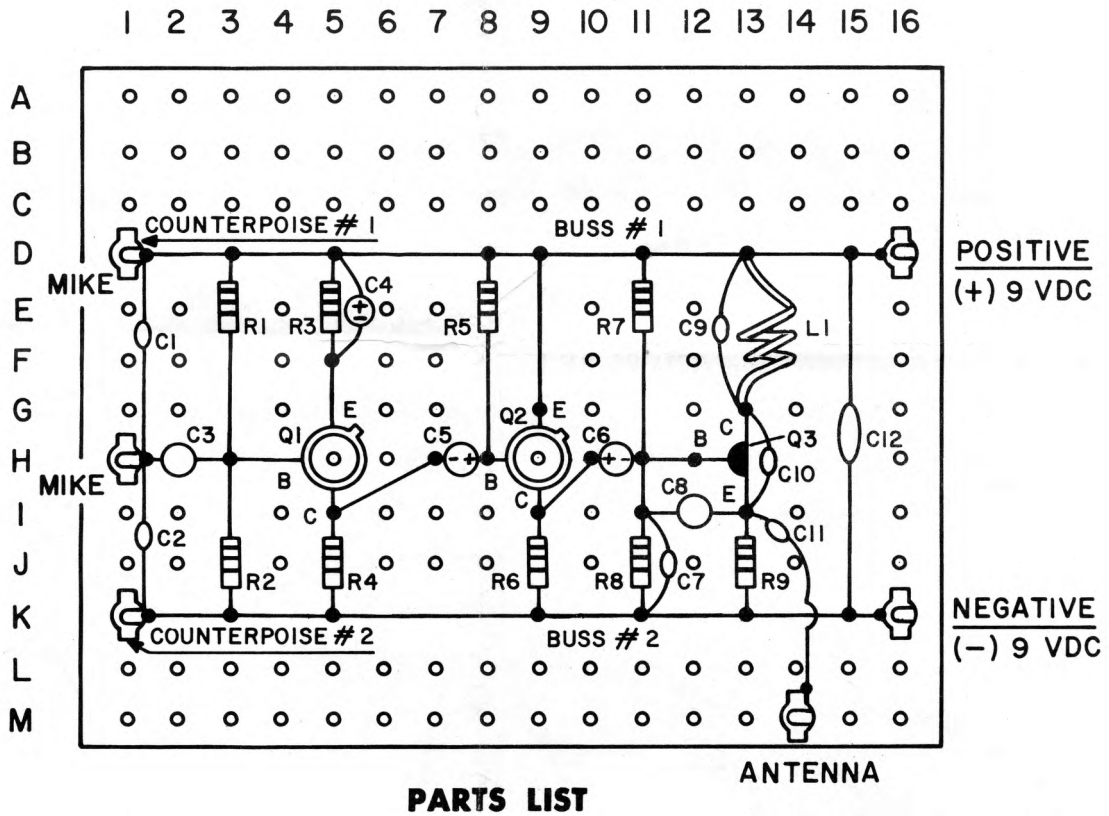
This wireless microphone has a range of 100 to 200 feet and can be received on any FM receiver covering the frequency range of 88 to 108 MHz. The circuit consists of an FM band oscillator and a two stage high gain audio amplifier. The audio frequency response of this unit is esesntially flat from 50 Hz to 12 KHz. Additionally the microphone gain is such that your voice will be picked up a few feet from the microphone. In fact you may use the wireless mike as a portable microphone to pick up conversations at a distance or as a wireless microphone for public address use.

The advantage of an FM wireless microphone over other types lies with the principle of FM detection. A good FM receiver will limit noise and other interference, and the AFC of your FM receiver will lock the receiver frequency to your FM wireless microphone frequency. Another advantage is the ability of FM frequencies to be propagated with a very short antenna, thereby eliminating a special antenna installation. In fact, you are cautioned against using more than eighteen (18) inches of wire for the antenna. This is in order to keep rediation down to the level required by the Federal Communications Commissions (FCC). A longer antenna, therefore, is not only illegal but will effect the quality and may even cause damage to the oscillator transistor.

INSTRUCTION MANUAL **PRICE: 50¢**

Fig. 1. Pictorial Diagram FM Wireless Microphone

TOP VIEW



PARTS LIST

Quantity	Description	Identification	Science Fair Part Number	Price Schedule
2	Transistor, PNP	Q1, Q2	99-4-105	1.00
1	Transistor, NPN	Q3	99-4-109	1.50
3	10 MFD Electrolytic Capacitor	C4, C5, C6	99-2-013	.50
3	25 PF Capacitor	C1, C2, C9	99-2-021	.20
1	.05 MFD Capacitor	C3	99-2-023	.20
1	.001 MFD Capacitor	C7	99-2-022	.20
1	6.8 PF Capacitor	C8	99-2-020	.20
1	5 PF Capacitor	C10	99-2-019	.50
1	12 PF Capacitor	C11	99-2-015	.20
1	.01 MFD Capacitor	C12	99-2-004	.20
1	470K ½W Resistor	R1	99-1-022	.20
3	15K½ W Resistor	R2, R3, R6	99-1-008	.15
1	220 Ohm ½W Resistor	R4	99-1-014	.15
1	27K ½W Resistor	R5	99-1-034	.15
1	10K ½W Resistor	R7	99-1-002	.15
1	4.7K ½W Resistor	R8	99-1-012	.15
1	390 Ohm ½W Resistor	R9	99-1-033	.15
1	Microphone		99-5-001	1.00
6	"Push in" Terminal		99-7-006 (set of 6)	.60
1	Battery Clip		99-7-003	.10

NOTE: Component values are subject to change and may vary 10 to 20 percent. However this circuit is so designed as to work satisfactorily within these extremes.

Science Fair™ kits are supplied with first quality parts engineered into "trouble free" circuits. However, if replacement parts are required, they can be obtained directly from the factory. When ordering parts be sure to include the Science Fair™ stock number and payment according to the above price schedule with your order. Minimum parts order $1.00 send orders to: Parts Dept., Science Fair Electronics, 2615 W. Seventh St., Ft. Worth, Texas 76107.

STEP-BY-STEP WIRING AND ASSEMBLY INSTRUCTIONS

The step by step instructions indicate a soldering requirement; however, these connections can be made by firmly twisting joining wires together. If the connection is secure the circuit will work for temporary or testing purposes. If you wish a more permanent circuit, it is always best to secure these connections by soldering. (Use resin core solder)

All leads protruding through the circuit board may be either soldered first and then clipped, or twisted together first, then clipped to length and soldered. Some may prefer to solder on the top of the board. Much of this is individual preference based on your own dexterity. Try wiring and soldering the way it seems most convenient to you!

This kit includes the all new Science Fair™ P-Box, manufactured from a revolutionary new heat resistant material with the back cover designed for use as a perfboard chassis. The material used is such that it can withstand the temporary heat required for normal soldering when the iron is applied directly to the leads or parts to be soldered. However, when heat is applied directly to the box material you may carve an opening in the box for the placement of controls, sockets, and additional parts easily and without the requirement of additional tools. This P-Box has a break away tab display hanger, which can be removed by bending it back and forth several times.

It is suggested that this manual be reviewed and that you familiarize yourself with the diagrams and operation of the kit before construction is begun. For best results, it is advisable to use the pictorial layout as this layout is drawn to actual size and will eliminate any problems of parts locations and lead dress.

Pay particular attention to the physical location of the transistor leads. Observe the tab position (emitter lead) on Q1 and Q2. Also note the lead locations on Q3 which has a different form. Improper connections to the transistor may destroy the transistor so be careful about this point.

1 (✓) Check the parts list to see that everything listed is included. Check each step as progress ( ).

2 (✓) Place the pictorial diagram (FIG. 1) near the perfboard chassis so that the pictorial can be used as guide for the exact placement of parts. The perforations on the board are numbered and lettered as in FIG 1. The numbered perforations run from left to right while the letters run from top to bottom. Any point on the board may be identified by this combination of numbers and letters. For example, resistor R5 uses points D-8 and F-8.

3 (✓) Mount the six (6) "push in" terminals in the positions indicated on the pictorial diagram. Install at the following points: mike-counterpoise #1 to point D-1, mike to point H-1, counterpoise #2 to point K-1, positive 9 volt to point D-16, negative 9 volt to point K-16 and antenna "push in" terminal to point M-14.

4 ( ) Cut two lengths of bare wire to exactly four (4) inches. Solder BUSS No. 1 to the positive "push in" terminal and run the other end (full taut) to counterpoise No. 1 "push in" terminal (clip off any excess length that may develop from pulling taut). Solder this end of BUSS No. 1 to the counterpoise #1 "push in" terminal. See FIG. 1

Now solder BUSS No. 2 to the negative "push in" terminal and the other end will connect to counterpoise No. 2 "push in" terminal — solder. See FIG. 1.

You are now ready to mount all resistors.

5 ( ) Mount resistor R1 — 470K (yellow, violet, yellow) from point D-3 to point H-3. Solder at point D-3 (to BUSS No. 1).

6 ( ) Mount resistor R-2 — 15K (brown, green, orange) from H-3 to K-3. Solder at point K-3 (BUSS No. 2).

7 ( ) Mount resistor R-3 — 15 K (brown, green, orange) from D-5 to F-5. Solder at D-5.

8 ( ) Mount resistor R-4 — 220 ohm (red, red, brown) from I-5 to K-5. Solder at K-5.

9 ( ) Mount resistor R-5 — 27K (red, violet, orange) from D-8 to H-8. Solder at D-8.

10 ( ) Mount resistor R6 — 15K (brown, green, orange) from I-9 to K-9. Solder at K-9.

11 ( ) Mount resistor R-7 — 10K (brown, black, orange) from D-11 to F-11. Solder at D-11.

12 ( ) Mount resistor R-8 — 4.7K (yellow, violet, red) from I-11 to K-11. Solder at K-11.

13 ( ) Mount Resistor R-9 — 390 ohm (orange, white, brown) from I-13 to K-13. Solder at K13.

You are now ready to mount all capacitors.

Note: Observe Polarity on capacitors C4, C5, C6.

14 ( ) Mount capacitor (C1) 25 PF from point D-1 to point H-1. Solder at D1.

15 ( ) Mount capacitor (C2) 25 PF from point H-1 to point K-1. Solder at K1.

16 ( ) Mount capacitor (C3) .05 MFD from H-1 to H-3. Solder at H-1.

17 ( ) Mount capacitor (C4) 10 MFD from D-5 to F-5. Observe polarity. Solder at D-5.

18 ( ) Mount capacitor (C5) 10 MFD from I-5 to H-8. Observe polarity.

19 ( ) Mount capacitor (C6) 10 MFD from I-9 to H-11. Observe polarity.

20 ( ) Mount capacitor (C7) .001 MFD from I-11 to K-11. Solder at K-11.

21 ( ) Mount capacitor (C8) 6.8 PF from I-11 to I-13.

22 ( ) Mount capacitor (C9) 25 PF from D-13 to G13.

23 ( ) Mount capacitor (C10) 5 PF from G-13 to I-13.

24 ( ) Mount capacitor (C11) 12 PF from I-13 to M-14. Solder at M-14 (antenna "push in" terminal).

25 ( ) Mount capacitor (C12) .01 MFD from D-15 to K-15. Solder at D-15 and K-15.

You are now ready to mount all transistors:

26 ( ) Mount transistor Q1. Connect emitter (E) to F-5, base (B) to H-3 and collector (C) to I-5. Solder all three leads. See Fig. 1 and 5.

27 ( ) Mount transistor Q2. Connect emitter (E) to D-9, base (B) to H-8 and collector (C) to I-9. Solder leads. See Fig. 1 and 5.

28 ( ) Mount transistor Q3. Connect emitter (E) to I-13, base (B) to H-12 and collector (C) to G-13. See Fig. 1 and 6. Solder at I-13.

29 ( ) Install a jumper wire from I-11 to H-11 and H-12. Connect all wires at these points and solder.

You are now ready to construct and mount the FM band coil.

Cut a four inch (4") length of wire off the wire provided. Strip off the insulation for at least one eighth of an inch at both ends of the wire.

Study Fig. 3 which visually demonstrates the technique of holding the coil forming pencil and wire in your hands for the actual coil winding. Three full turns around the pencil with approximately one-fourth inch (¼") of lead length (on both leads) is all that is required. You may wind in a clockwise or counter clockwise direction, that is, around the pencil to form a three turn coil. Remember, leave at least ¼ inch left over for lead length. See completed coil — Fig. 4.

The completed coil is to be mounted between D-13 and G-13. The leads should slip into the holes together with the other component leads. Solder D13 & G13.

Now that all components have been installed, you can clip off all excessive leads.

Microphone Wires

Cut two lengths of wire to approximately 2 inches. Strip ¼ inch of insulation off both ends of each wire. The microphone element has a terminal strip with two solder points. Connect and solder one of the 2 inch wires to either one of these points and connect and solder the second wire to the other.

Operational Notes

You may now connect the microphone, counterpoise wire, antenna wire and battery to the FM wireless microphone. All connections are clearly marked on the pictorial diagram (FIG. 1). Connect the two leads from the microphone element to the "push in" terminals marked "Mike".

Connect an 18" length of wire to the antenna "push in" terminal. Run this wire straight up (vertical) and taut similar to a walkie talkie whip antenna.

Connect an 18 inch length of wire to the counterpoise "push in" terminal. Use either counterpoise #1 or #2. Note: At times transmission may be reasonably clear without using a counterpoise connection.

Connect the black wire of the battery clip to the negative (–) 9VDC "push in" terminal.

Connect the red wire of the battery clip to the positive (+) 9VDC "push in" terminal.

You may now connect the battery clip to a 9 volt battery.

TUNING YOUR "STATION" IN

Tune your FM radio across the dial from 88 to 108 MHz. You should hear the wireless microphone as a loud feedback (howl). You may ask someone else to talk in the microphone while you tune across the dial. If by chance you do not pick up the wireless microphone, try adjusting the frequency by either squeezing the ends of the coil together or by pulling the coil apart a bit . . . something like pulling on a spring! One or the other adjustment will bring the wireless microphone into the frequency range of your FM receiver. Once you have established the frequency of operation, you can have a friend test at a further distance away from the FM receiver. For best results, the antenna and counterpoise wires should be spread out away from one another. Also avoid touching the wires or moving the unit about while transmitting. The movement may cause fading because of the very high frequency used. Another precaution – do not lay the unit on a metal surface. A large metal surface may short the circuit, detune the oscillator or absorb the very high frequency signal from the wireless microphone.

In addition to the microphone operation, this wireless microphone is suitable for many other uses, such as music transmission. You should have very good results from most crystal or ceramic phonograph tone arms. May we suggest Radio Shack's Realistic tone arm and cartridge Cat. No. 42-004. The wireless microphone will also work with other types of tone arms but not with as much volume as a ceramic or crystal type. The tone arm comes equipped with two leads which may be connected directly to the two "mike" push in terminals. Note: If you like the microphone may be left connected so that "spot" announcements can be made between alternate music broadcasts.

OPTIONAL POWER SOURCE – BATTERY ELIMINATOR

Use Science Fair AC to DC Power Supply Kit #28-104. For inter-connection See Fig. 7.

FIGURE 2
SCHEMATIC DIAGRAM

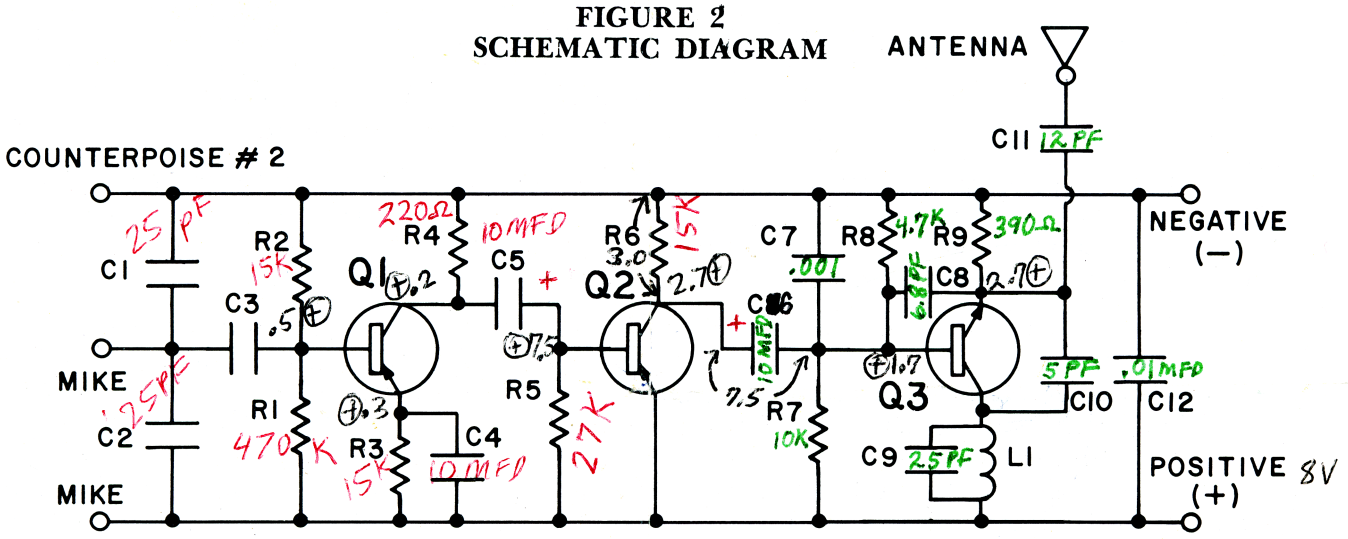


FIGURE 3
METHOD OF WINDING FM COIL

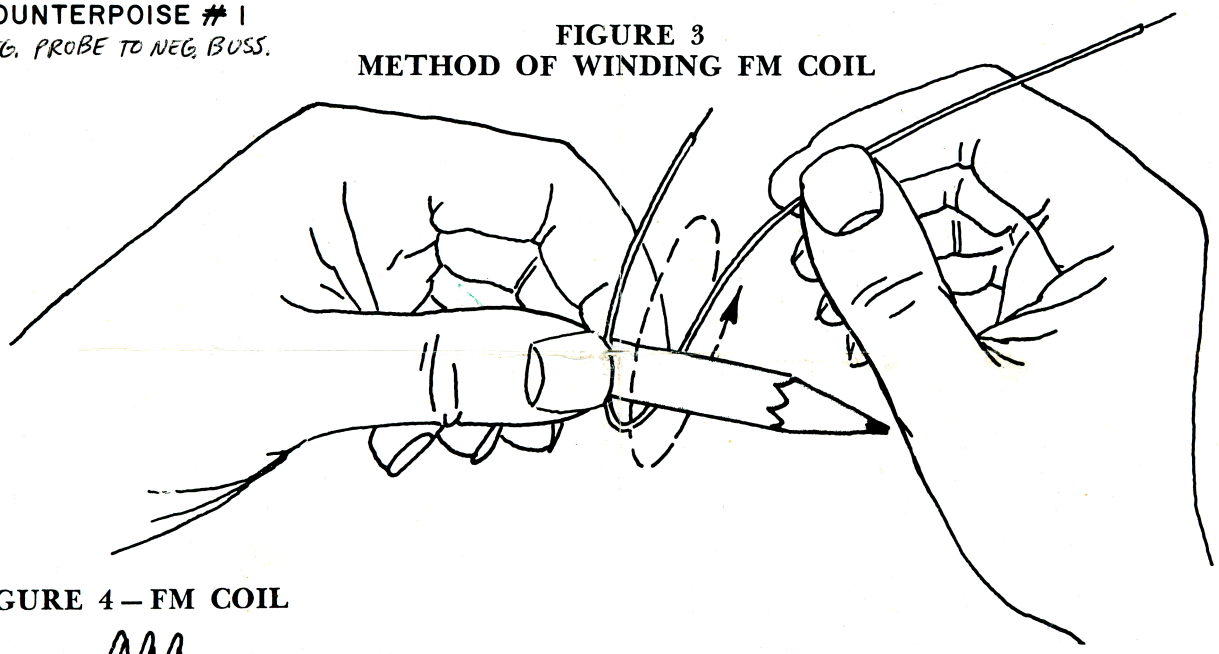


FIGURE 4 — FM COIL

FIGURE 5 PNP TRANSISTOR Q1, Q2
BOTTOM VIEW

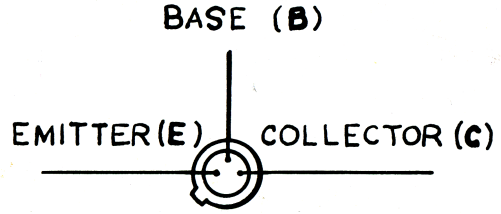


FIGURE 6 NPN TRANSISTOR Q3
BOTTOM VIEW

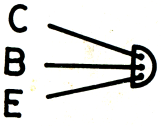


FIGURE 7 — INTERCONNECTION TO AC POWER SUPPLY